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REVIEWS AND ABSTRACTS OF LITERATURE

The History and Theory of Vitalism. HANS DRIESCH. London: Macmillan and Company. 1914. Pp. viii + 239.

The Philosophy of Biology. JAMES JOHNSTONE. Cambridge: Cambridge University Press. 1914. Pp. xv + 391.

Vitalism will not down. A consideration of recent literature drives us to this conclusion. One of the most widely read philosophical works of the past few decades (Bergson's "Creative Evolution") is primarily a defense of this doctrine. The writings of Driesch, both in German and in English, have followed one another with marvelous rapidity and forced themselves upon the attention of even the most unswerving mechanist. And now there comes a volume by a more recent recruit, who has hitherto been chiefly associated in the public mind with the "conditions of life in the sea."

The strength of vitalism's appeal has a twofold basis: (1) the manifest failure of dogmatic mechanism, as thus far formulated, to explain (even in the sense of adequately describing) certain conspicuous facts of development, function, and behavior; and (2) the unpalatable corollaries, religious and ethical, which are supposed to follow inevitably the acceptance of a radical mechanism. Considerations of the former class appeal primarily to the trained biologist, while the latter have most weight with the non-scientific reader. The weakness of vitalism lies in its failure to offer anything but a formal or verbal solution of the difficulties which it raises, and in its insistence on indeterminism, a doctrine which, if applied consistently, would stifle experimental research in biology.

The controversy between mechanism and vitalism is by no means a new one. It dates back to the Greeks. Nor is it an isolated one, apart from other fields of thought. It has many points of contact with the time-honored problems of materialism versus idealism, determinism versus free-will, parallelism versus interactionism, preformation versus epigenesis, and doubtless others.

Driesch, in the volume under consideration, offers us a very useful and interesting historical sketch of the evolution of vitalism from Aristotle to the present day. Both the exponents and the antagonists of the doctrine are given a hearing. We have critical discussions of the views of Aristotle, Harvey, Stahl, Buffon, Needham, Maupertuis, C. F. Wolff, Bonnet, Haller, Blumenbach, Bichat, Kant, Oken, Reil, Treviranus, von Baer, J. Müller, Liebig, Schopenhauer, Lotze, Bernard, Dubois-Reymond, Helmholtz, Wigand, Bunge, von Hartmann, E. Montgomery, G. Wolff, Reinke, and others. Certain of these, who thought they were opponents of vitalism (*e. g.*, Lotze, Claude Bernard) are found, on analysis, to be vitalists at heart, while Bunge, who is commonly identified with that school, owes this fact to his having had the temerity to concede the possibility of a vitalistic interpretation at a time when biologists, almost as a unit, were on the other side.

The "criterion," Driesch tells us in advance (p. 6), "by which we can test every body of doctrine offered by history" is a recognition of the difference between "static" and "dynamic teleology." The former, while it recognizes the fact of organic purposefulness, regards it as "the result of a special constellation of factors known already to the sciences of the inorganic" (p. 1). This was the earlier view of Driesch himself. The second alternative, to which alone he applies the term "vitalism," is that "the processes of life [are] purposive because of an unanalyzable autonomy" (p. 5). These last words will probably strike most readers as hopelessly vague, but such a criticism, at this point, would of course be premature. It should first be learned whether the author gives them a more definite meaning before he closes.

The volume is divided into two sections, the first historical, the second theoretical. While a résumé of the former section is scarcely practicable, a few points deserve passing mention. Driesch censures scientists at large for their failure to read Kant in the original, and undertakes to fill out this gap in their education by a brief exposition of Kant's views, so far as they bear on biological problems. I am afraid that few of us will be thereby moved to undertake a more exhaustive study of the "Critiques." This is not intended as a reflection on the expositor, whose discussion is largely a running commentary on carefully chosen citations from the philosopher. When Driesch, a sympathetic student and apparently a profound admirer of Kant, admits that many of these utterances are obscure and inconsistent with one another, and when he tells us more than once that "almost any view could find material to support it in the 'Critique of Judgment'" (p. 77), the average biologist may be pardoned if he regards other reading as more imperative. Surprising enough, in view of Driesch's searching studies of Kant, is his confession that, after all, he can not feel sure just what the Königsberg philosopher did believe regarding vitalism, and his expression of doubt as to whether Kant himself really knew. After leading us through a maze of seemingly contradictory opinions, our author states, as his "final attitude towards the biological content of the 'Critique of Judgment,'" that "in the case of man and his actions Kant is indubitably a vitalist, while as regards the facts of organization he is only problematically so" (p. 86).

Historically, we are told, vitalism divides itself into an earlier and a later phase, separated by a gap, occurring during the second half of the nineteenth century, when it was temporarily stifled, or "out-shouted" by the dominant mechanism of the period. Regarding the passing of the older vitalism our author has this to say: "It is said of political parties that they die out when they no longer have opponents to contend with. Something similar is also true of scientific and philosophic theories; . . . they become lax and careless in their logical deductions; they forget to justify every assertion in the light of the theory of knowledge. . . . In such circumstances a doctrine declines and eventually dies. It may, of course, have nevertheless been the right explanation, but what was right in it was buried under a mass of confused and false details. The opposing doctrine which takes its place can not be said to have refuted its predecessor as a whole; for it has refuted only certain particulars which were wrong and not well founded on it. . . . But, finally, the old theory rises again in a new and improved form, thankful for honest and well-founded criticism, even though that criticism was wrong in its essentials—and that is exactly what happened in the case of the old Vitalism" (pp. 123–125).

In a chapter on "The Critics and the Materialistic Reaction," Driesch repeats his already familiar attacks on "Darwinism" and the zoology of the later decades of the nineteenth century. The virulence and exaggeration which pervade these passages are at times ludicrous: "Darwinism, which explained how by throwing stones one could build houses of a typical style" (p. 137); "Botany [as contrasted with zoology] remained a science" (p. 139); "Animal morphology celebrated a perfect witches' orgy. It elaborated a phantastic construction of so-called 'genealogical trees'" (p. 140); the "laws" fabricated by "general zoology" "simply violated every principle of the formation of scientific concepts" (p. 141); "The Darwinian school studied the construction and development of animals only so far as to compare them with one another, and to concoct genealogical trees" (p. 149).

How did zoology finally extricate itself from this "unworthy state"? "It was, on the one hand, the physiology of form construction which originated in His, and was materially advanced by Roux, and, on the other, the exact researches made upon variations, hybrids, and mutations, which ushered in the much-needed reformation" (pp. 141, 142). And it was this new movement in biology, we note, which likewise ushered in Neo-vitalism. "All new facts which support the theory of the autonomy of life have been won in this field of investigation [*i. e.,* "mechanics of development"] with the exception, of course, of those which are derived from the analysis of human action" (p. 171). As is well known, Driesch's own chief contributions to biology were in the former field.

In this volume and elsewhere Driesch is singularly indifferent to the great scientific awakening which followed the publication of the "Origin of Species." To him its only results of consequence seem to have been the apotheosis of chance and an insensate desire to trace out "genealogical trees." The latter, in particular, are the objects of his scorn. This appears to be less because they were imaginary constructions than because, even if true, they would have had very little importance for biology. Apart from some object or guiding principle, manifesting itself in evolution, no mere description of past happenings, he thinks, can be of much significance. Indeed, he denies our right to apply the term "evolution" to a process thus conceived. It would be merely a "cumulation."

It is doubtful whether most biologists whose work extends back through the past twenty or thirty years would be willing to grant that their early labors had been wasted. Morphology and embryology, guided by the clarifying idea of descent, were certainly much more profitably occupied than before that all-important clue was furnished them. If there was much unbridled speculation concerning genetic relationships, this fact does not vitiate the really great and enduring achievements of the period. Many of the "homologies" established by comparative anatomy and embryology will doubtless never be overthrown, while our conviction that true homology denotes blood relationship is one of the crowning achievements of the past century. Such careful descriptive work, indeed such wholly legitimate speculation respecting animal affinities, were necessary before an inquiry could profitably be made into "developmental mechanics" or into the moving forces in racial evolution.

It must be remembered, too, that many of our present leaders in biology were active participants in that "witches' orgy" of twenty years ago. If they passed over in a body to other lines of work, it was due partly to a realization that, at this juncture, the newly opened fields were more promising, partly to the gregariousness of even so highly evolved an animal as *Homo scientificus.* It was no confession of the futility of their past endeavors.

In the second part of Driesch's volume he leaves the historical development of the vitalistic doctrine and takes up its theoretical justification. Unlike his former discussions of the subject (*e. g.,* "Science and Philosophy of the Organism"), the present one does not "*ascend* from the facts to a theory, but *descends* from a theory, *i. e.,* a logic of possibilities, to the fact, *i. e.,* to realities." Thus he gives us for the first time a "deductive Vitalism as a real union of logic and biology, or rather as a sort of filling out of certain departments of logic with biological facts" (p. 188). This would seem to mark the final step in Driesch's progress from an experimental zoologist to a professor of philosophy.

On purely logical grounds, so he tells us, he is able to discover four possible "types of becoming." The fourth type is the one with which, as a vitalist, he is chiefly concerned. This is "becoming which changes the state of the system in such a way that the number of *different kinds of relations* among the things increases without there being any kind of spatial agency that can be made responsible for this increase. In this case 'immaterial' or non-spatial agents must have been at work. . . . The most important form of this type of becoming would be that in which a distribution of the things in one system of the form of a mere *sum* would be transformed into a distribution that would be in some sense a *unity* or *totality,* without any spatial mechanical predetermination of this totality. . . . We shall call this type of becoming *unifying* or *individualizing causality*" (pp. 200, 201). Needless to say, this type of becoming is the one which is presided over by "entelechy."

We fear that the normal, unsophisticated scientist has much the same distrust of a logician that a large section of the public has of a lawyer, and for the same reason. If the interests of his client demand that a proof be found, the successful lawyer will find it—that is the essence of his profession. Correspondingly, we may well query whether a "logical possibility" of vitalism would ever have been discovered except by a convinced vitalist. And we may be perfectly sure that no one who is not already convinced will be converted to vitalism by such a deductive "demonstration."

Driesch's "empirical proofs of vitalism" and much of his subsequent discussion are little more than a condensed repetition of what he has already told us in his "Science and Philosophy of the Organism." His arguments have already been treated at some length in this JOURNAL[1] by the present reviewer, and further consideration seems unnecessary here. I may say, however, that while I can not believe that Driesch has offered us anything more than a pseudo-solution of the problems he has raised, I believe that the problems themselves are real ones. And furthermore, I believe that in precisely formulating these problems Driesch has conferred a real and lasting service on biology. In recognizing their importance he has displayed a much more profound insight than some of his critics, who are content with repeating mere conventional phrases by way of reply.

Those who knew of James Johnstone only as the writer of an instructive work on the bionomics of the sea[2] were scarcely prepared for this more recent volume dealing with the meaning of life itself. By many biologists such an excursion into philosophy will doubtless be regarded as the first step in the undoing of a man of science. And the example of Driesch is sometimes held up as a terrible warning. Whether or not this is true in Johnstone's case time alone can tell. Unfortunately for the prognosis, we find our philosopher consigning important fields of organic happening to "spontaneity" and frankly stating that "there are organic differences which have no causes" (p. 242). To accept this viewpoint consistently is to admit the futility of experimental research in what we now regard as some of the most promising fields of biological endeavor. On the other hand, it must be conceded that ingenious experiments have been devised with the express object of determining whether or not vital phenomena are primarily purposive, and that to this extent vitalism has played the part of a working hypothesis.

The work of Johnstone is a skilfully blended mixture of the teachings of Bergson and those of Driesch, a fact which the author freely admits in his introduction. As Bergson's special contributions we recognize "duration," the "vital impulse," the arrest of the dissipation of energy by living things, and the suggestive analogy between the scientific account of natural phenomena and a series of moving pictures; also the relation between the animal and plant kingdoms in nature and the dissociation of originally combined tendencies during evolution. From Driesch are obviously derived "entelechy," the "intensive manifoldness," and many of the biological facts introduced as evidences of vitalism. Indeed, throughout the book, we meet with no important line of argument which is not already familiar to one who has read "Creative Evolution" and "The Science and Philosophy of the Organism." But it would be unjust to let the matter rest here. Johnstone has thoroughly assimilated the doctrines of his two masters and presented them in his own words, illustrated to a great extent by his own examples. He has largely spared us the perfervid rhetoric of the one and the metaphysical entanglements of the other. The outcome is a very readable and suggestive volume, by no means lacking in originality.

As we should have naturally expected, the work is strongest in its portrayal of the fundamental inadequacy of much of the current mechanistic

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[1] Vol. VII., pages 309–330.

[2] "Conditions of Life in the Sea." Cambridge University Press. 1908.

"explanation" of vital phenomena. But I can not believe that either Bergson or Driesch or Johnstone has contributed much to the positive solution of these problems.

Johnstone's argument from the second law of thermodynamics agrees pretty closely with that of Bergson, and is open to the same criticism. Accepting as "scientifically" demonstrated the law of the dissipation of energy and the consequent decrease of diversity throughout the universe, he tells us that nevertheless "we are certain that it is not universally true. For there must always *have been* an universe—at least our intellect is capable of conceiving beginning. . . . We refuse to regard the problem as insoluble, and we must think of the second law as true of our physical experience only . . . we have to seek for an influence compensatory to it" (p. 64).

This sounds promising and we read on expectantly. Living organisms, he tells us, following Bergson, are characterized by their capacity for accumulating energy which otherwise would pass into low-temperature heat and become unavailable for further happening. The energy thus accumulated is subsequently utilized with a minimum of dissipation, since "in the animal organism chemical energy transforms directly to mechanical energy without passing through the phase of heat" (p. 69). Moreover, in living things energy transformations are held to be reversible in a sense that is not true of non-living. "Such concepts as temperature and pressure are *statistical* ones, and are applied to the mean properties of a large number of molecules" (p. 116). The disappearance of molar temperature differences involves the loss of available energy, only because we can not put to use the differences in the energies of individual molecules. This leads naturally to an introduction of "Maxwell's Demons." And the upshot of the whole discussion is that "primitive organisms, or even the tissue elements in the bodies of the higher organisms," may play the part of these demons, and thus possess the "power of directing physico-chemical processes" (p. 119). I may remark that this possibility is made much more plausible by our author than would be inferred from such a bare statement as I have given.

Furthermore, this struggle "towards averting or retarding the progress towards dissipation, or irrecoverable waste, of cosmic energy—that of the sun's radiation, and of the motions of the moon"—is manifested in the activities of all organisms, notably those of man himself. Thus, "life as a whole, on the earth, does not conform to the law of dissipation. That which is true of the isolated processes into which physiology decomposes life is not true of life. . . . Solar radiation falling on sea and land fritters itself away in waste irrecoverable heat, but falling on the green plant accumulates in the form of available chemical energy. The total result of life on the earth in the past has been the accumulation of enormous stores of energy in the shape of coal and other substances. By its agency degradation has been retarded" (p. 82).

This is all interesting and suggestive, though not entirely convincing. But even if Johnstone's whole line of argument be accepted, how far does it take us? The author himself tells us at one point that living things constitute but a "film of inconceivable tenuity" covering the earth's surface. So this reversal of the law of dissipation can not apply to more than an infinitesimal part of the universe. And even here all that is claimed is that "the second law of thermodynamics does not restrict the energy-transformations . . . *to the same extent*[3] that it restricts the energy-transformations of the physico-chemical mechanism" (p. 69). He grants, as he must, the loss of heat by "warm-blooded" animals and even, to a lesser extent, by others.

Is this slight barrier, then, all that stems the torrent of dissipating energy throughout the universe? We look in vain for a further suggestion from Johnstone. Bergson does, indeed, intimate that life is much more prevalent in the universe than we are wont to suppose, but even this admission helps us little. Nothing short of a complete hylozoism would meet the needs of the situation. Unless there are factors adequate to undo the *whole* work of degradation, the universe is doomed to extinction.

I shall not here discuss Johnstone's other arguments for a vitalistic interpretation of biological phenomena, though they constitute a considerable part of the volume at hand. As I have already stated, they are substantially the arguments of Driesch and of Bergson. It is my belief that they can be met only by departing somewhat from the traditional mechanistic standpoint. The direction in which I believe the solution to lie has already been indicated in my review of an earlier work of Driesch's (*op. cit.*). I hope in the future to amplify this theme.

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The Elementary Forms of the Religious Life: A Study in Religious Sociology. ÉMILE DURKHEIM. Translated from the French by Joseph Ward Swain. London: George Allen & Unwin, Ltd. New York: The Macmillan Company. 1915. Pp. xi + 456.

This careful translation of Professor Durkheim's now three-years-old work will be welcomed by all interested in sociological, religious, and epistemological theory. The translation is literal, hence much of the grace and brilliancy of Professor Durkheim's style has been lost in the process. On the other hand, Mr. Swain, the translator, is himself a student and faithful disciple of the French sociologist, hence we may be sure that the master's meaning has in all cases been strictly adhered to.

The student of social science has long been accustomed to associate Professor Durkheim's work with the pronounced tendency to emphasize the social basis of all socio-psychological phenomena. Never before, however, has this emphasis been so absolute and categorical as is the case in the author's analysis of the religious life. The data for the analysis are furnished by the totemic system of Australia, a field which Professor Durkheim handles with an authoritativeness born of systematic study extending over many years.

At the close of an extensive and painstaking argument the author is led to identify the core of all religion with *mana,* the belief in an imper-

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[3] Italics mine.